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polyethersulphone, polytetra-  
fluoroethylene, polyfluoroethylene  
propylene, silicone rubber are used as  
materials sterilisable by means of  
steam, and plastics materials such as  
polystyrene, polyacrylobutadiene  
styrene, cellulose ester, are used as  
materials sterilisable by means of gam-  
ma radiation. The retractor may be  
constructed in one piece or more than  
one piece and as an example comprises  
a hook blade section 3, which is light  
conducting (e.g. glass, polymethyl-  
methacrylate, polycarbonate), and has  
a light egress aperture 8 directable  
towards the injured area, an upper  
securing element 2 of hook shape and a  
lower securing element 1 also of hook  
shape. Both securing elements have a  
handle section 20 and 19 respectively  
and a hook section 22 and 21 respec-  
tively. The upper element 2 has an  
aperture 9 for light egress and an  
insertable element of steel is provided  
as a light conductor connector 10.

(54) **Retraction for surgical purposes**  
(57) A retractor for surgical purposes,  
which may be assembled according to  
purpose of application and consists of  
material sterilisable by means of steam  
and/or sterilisable by means of gamma  
radiation. Glass, metals and plastics  
materials such as polysulphone,  
polyetherketone, polycarbonate,

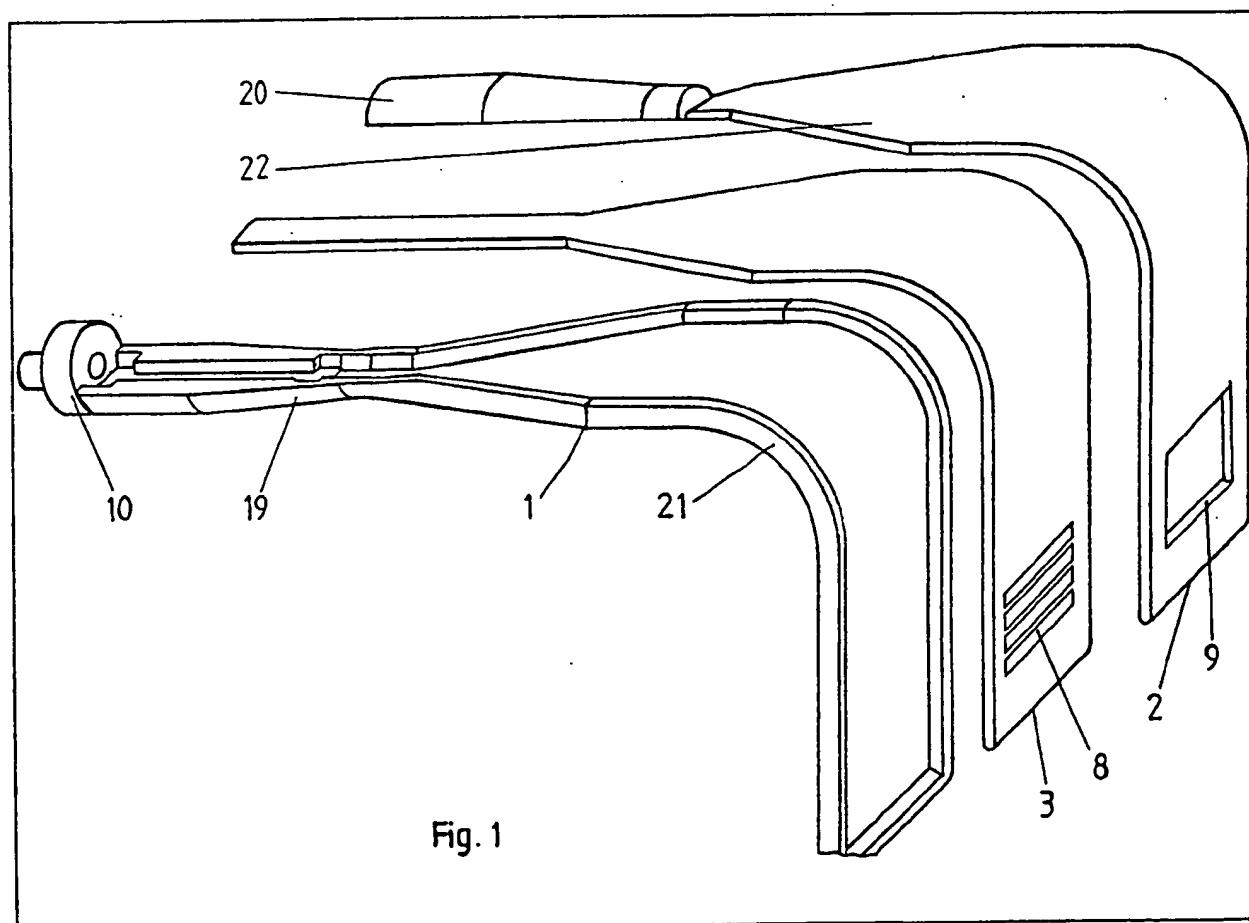


Fig. 1

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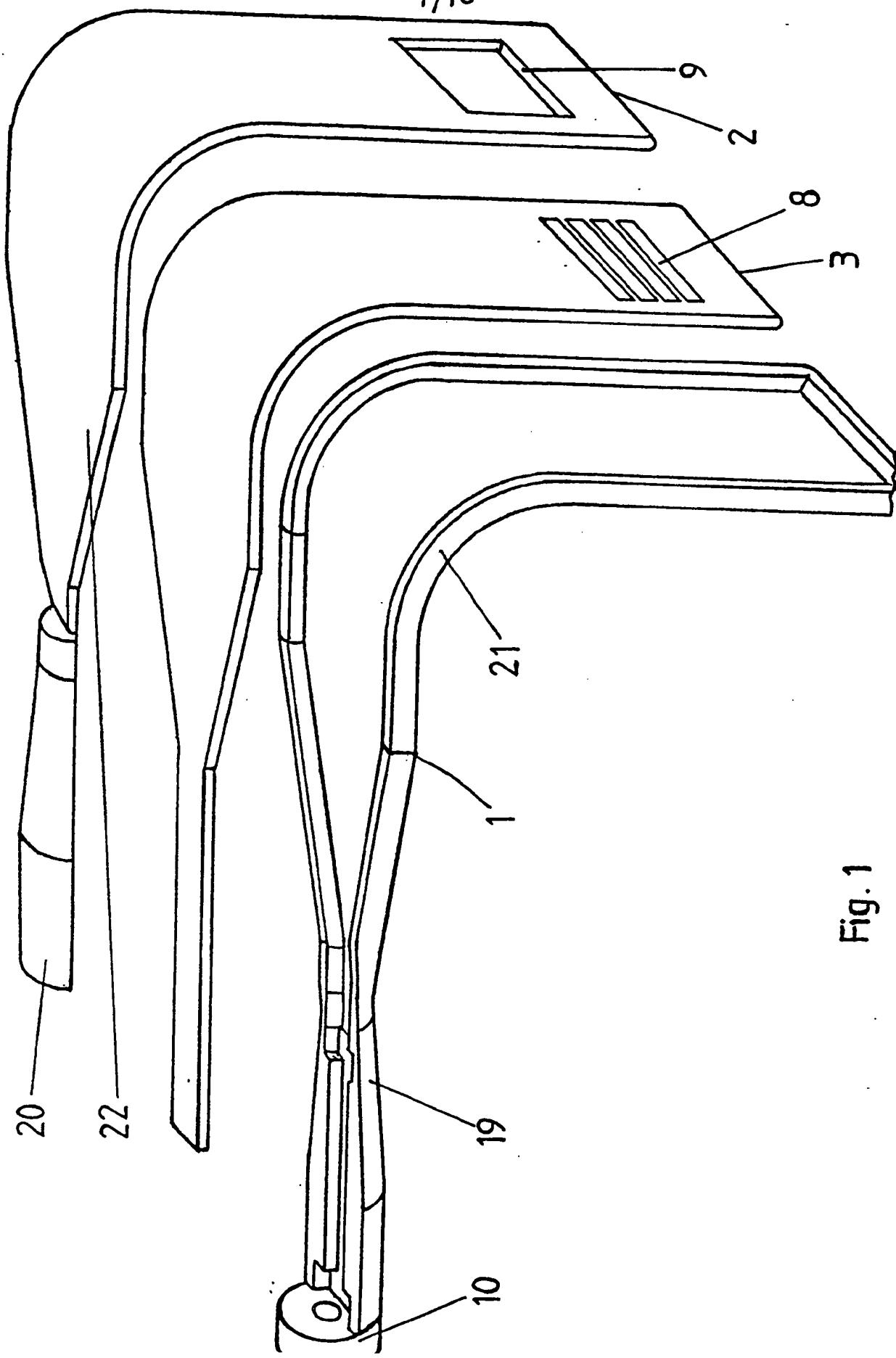


Fig. 1

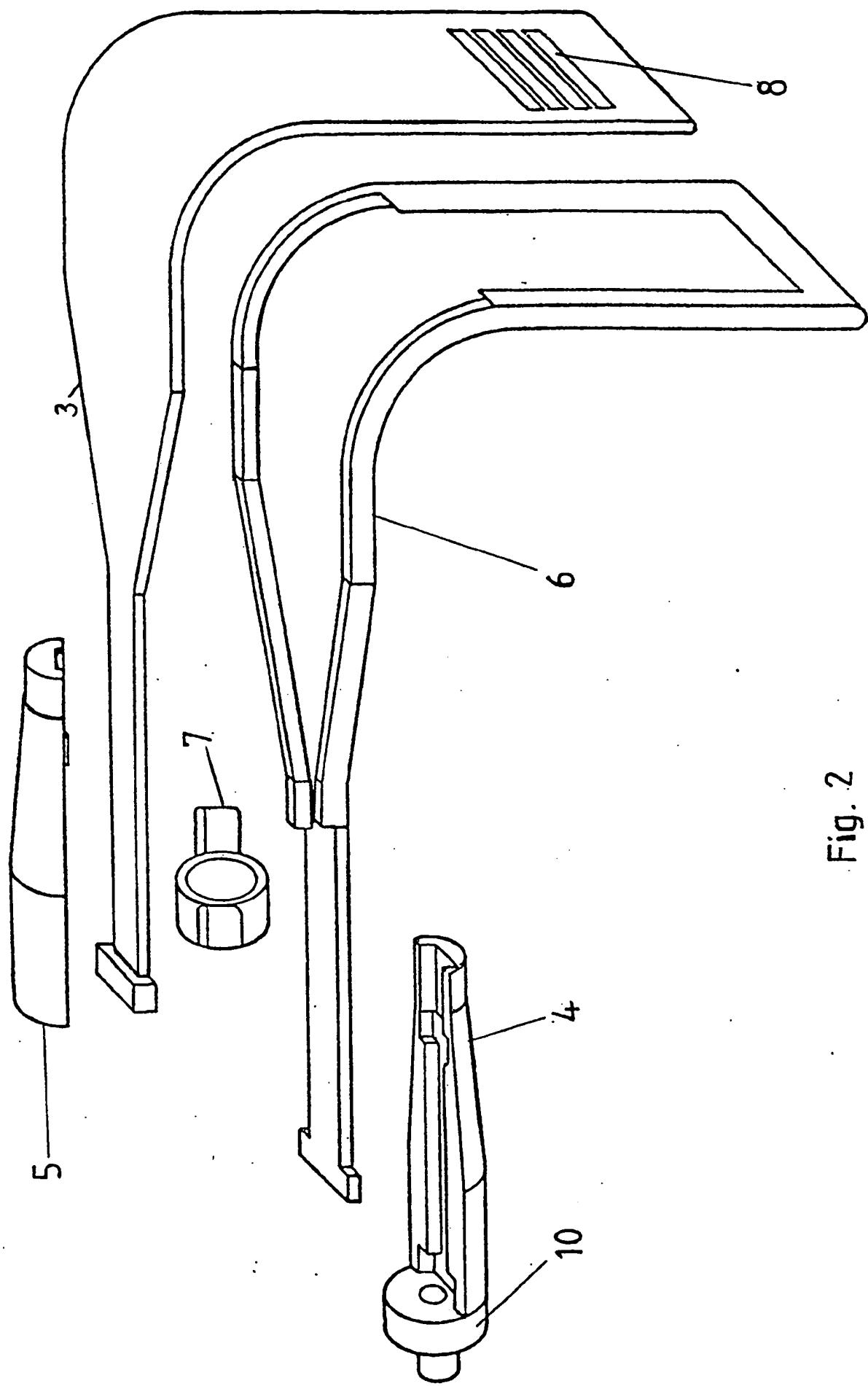


Fig. 2

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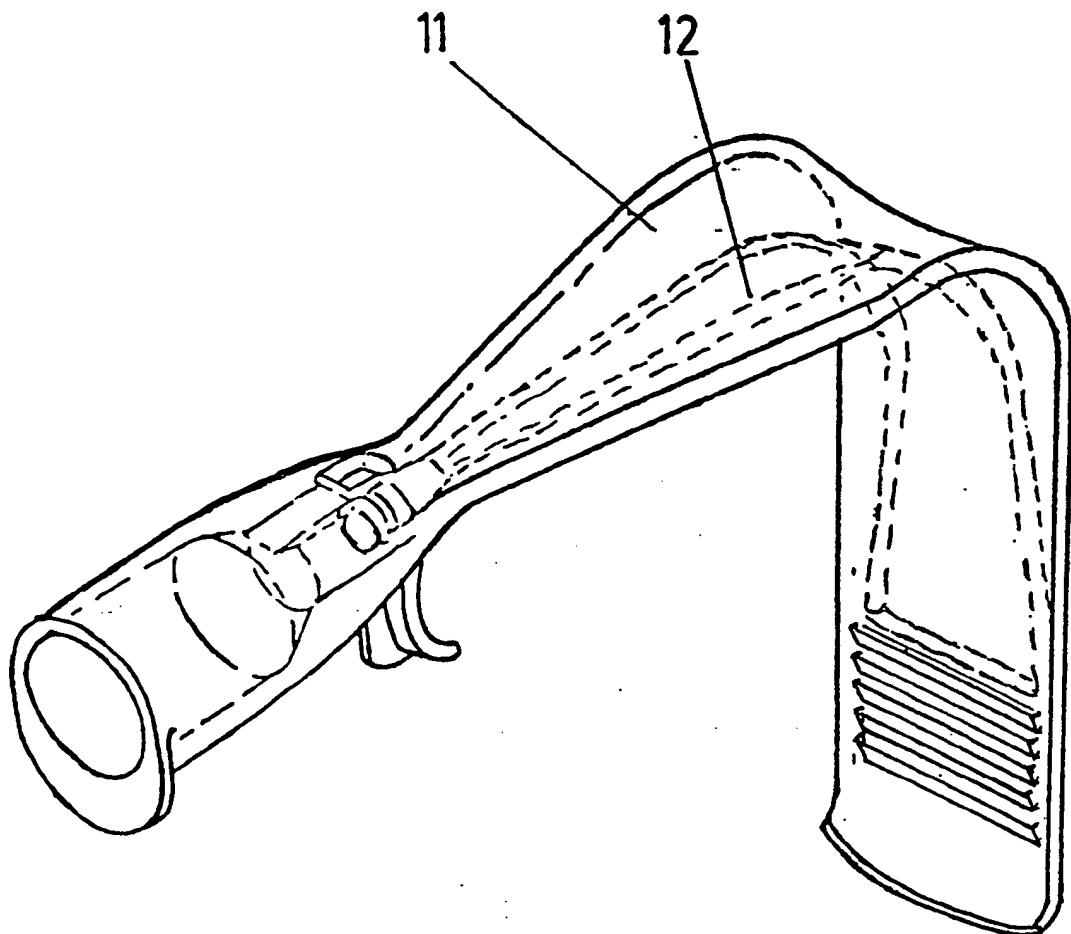


Fig. 3

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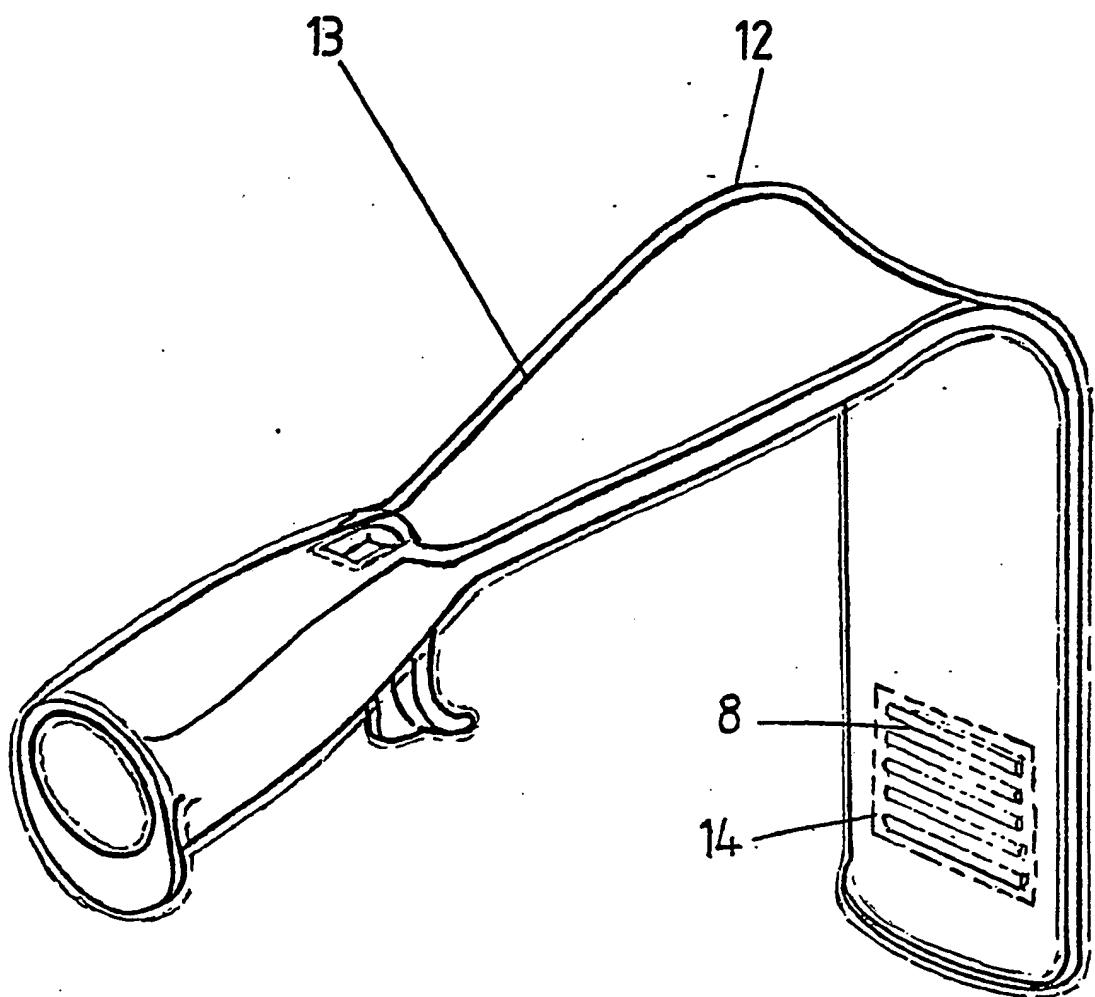


Fig. 4

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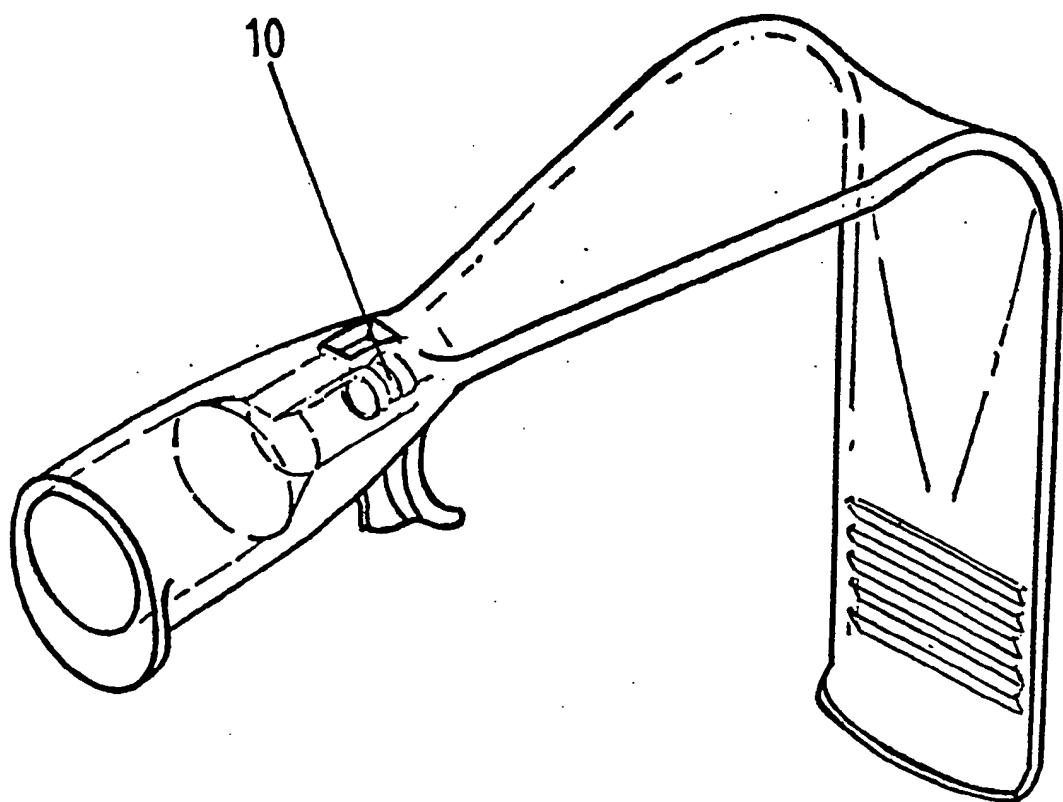


Fig. 5

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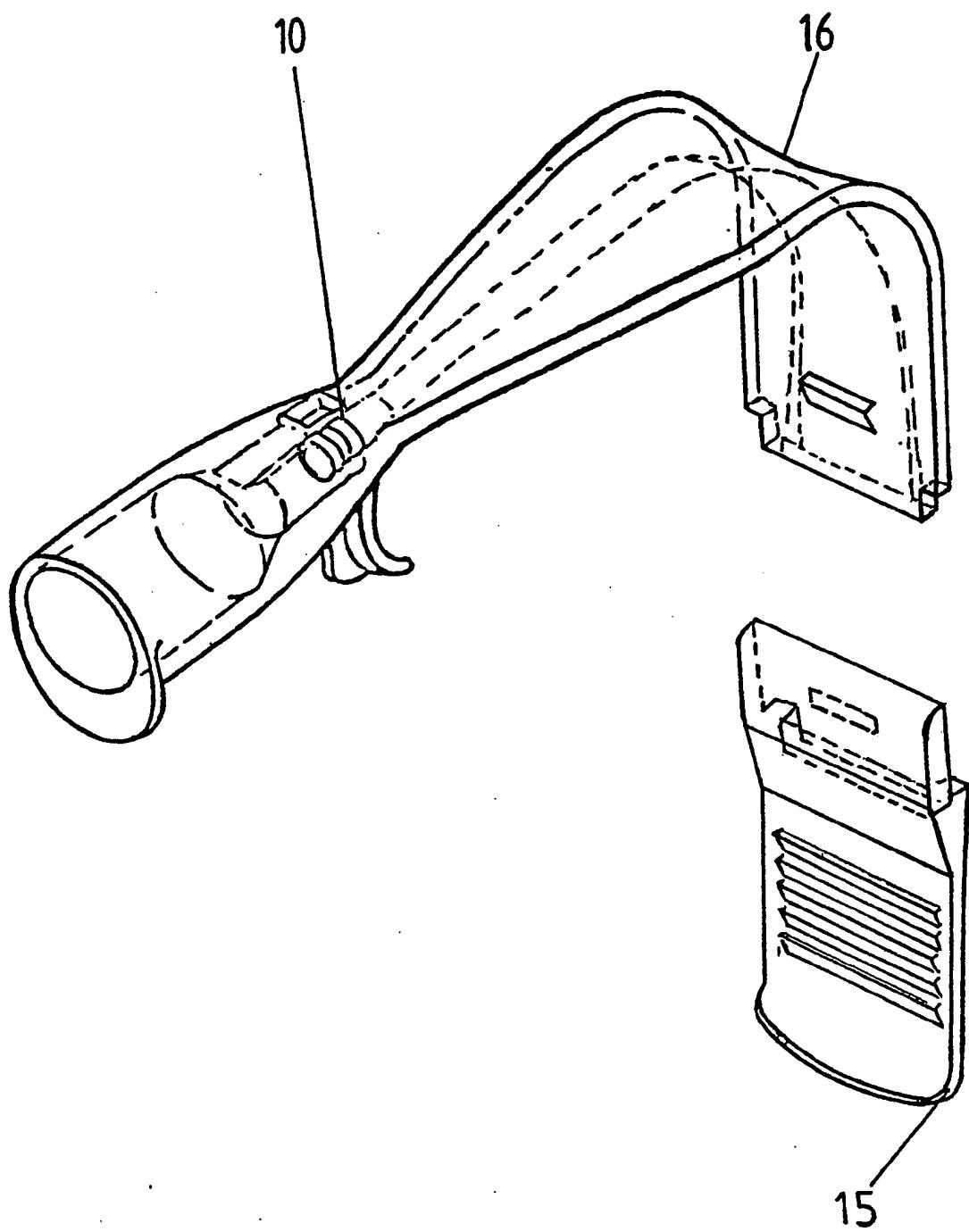


Fig.6

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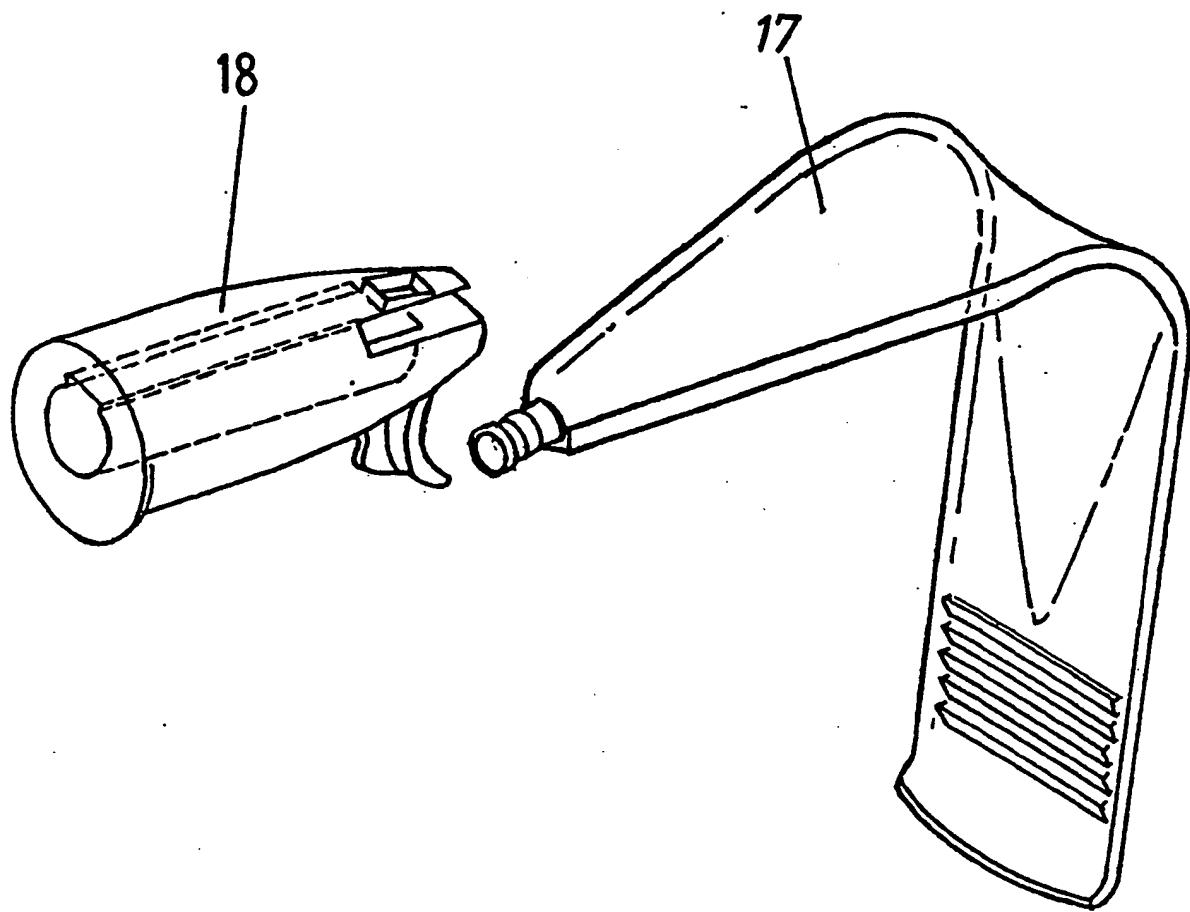
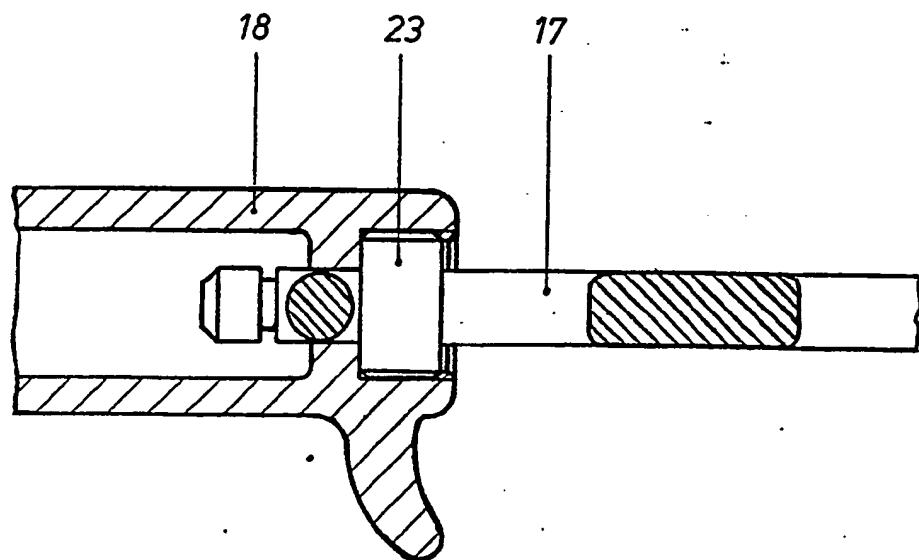


Fig.7

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*Fig. 8*

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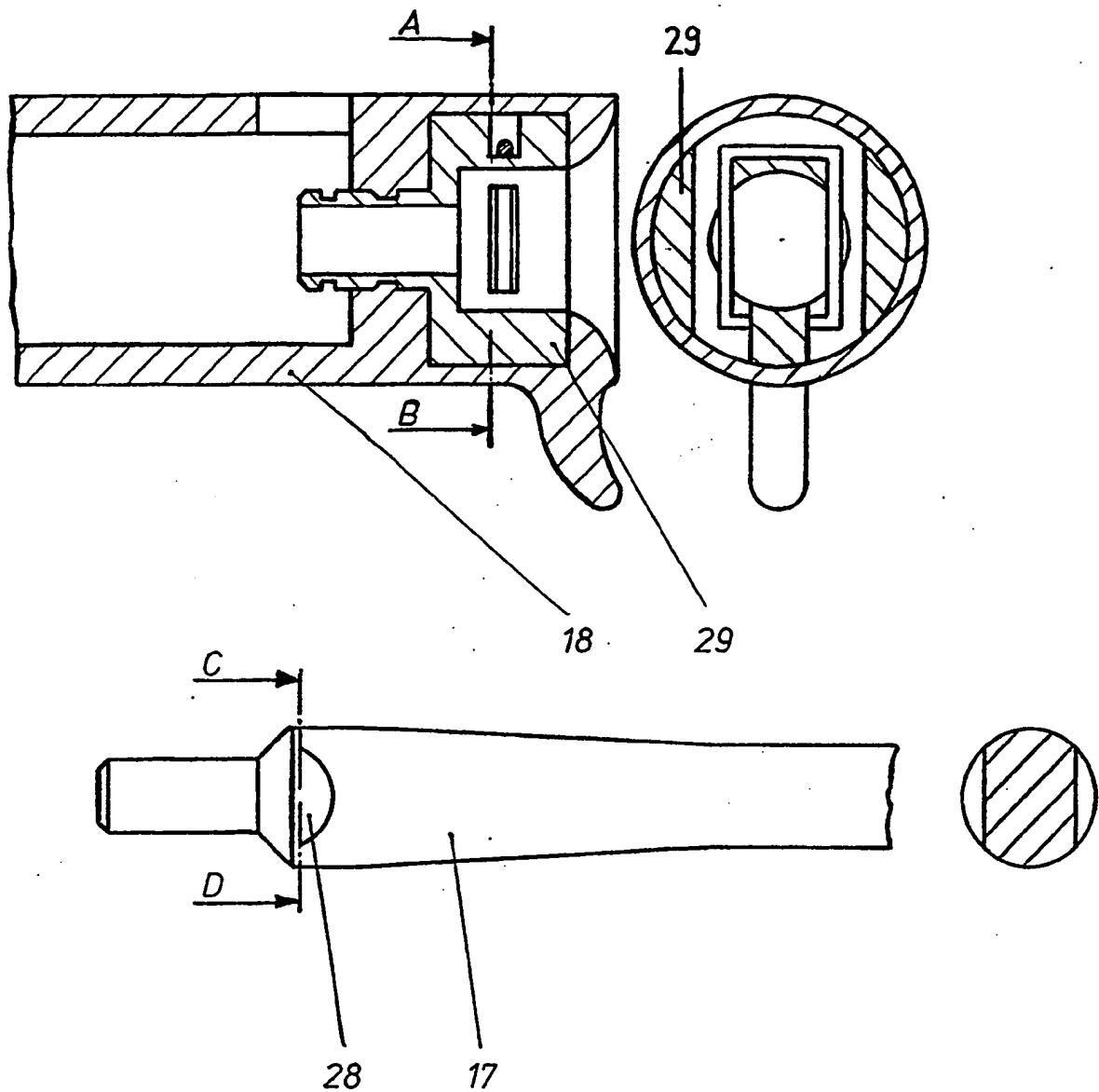


Fig. 9

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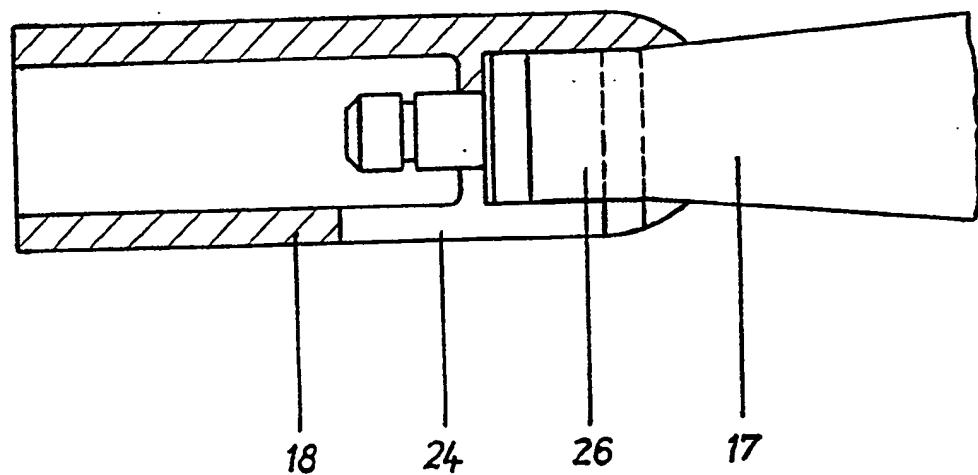
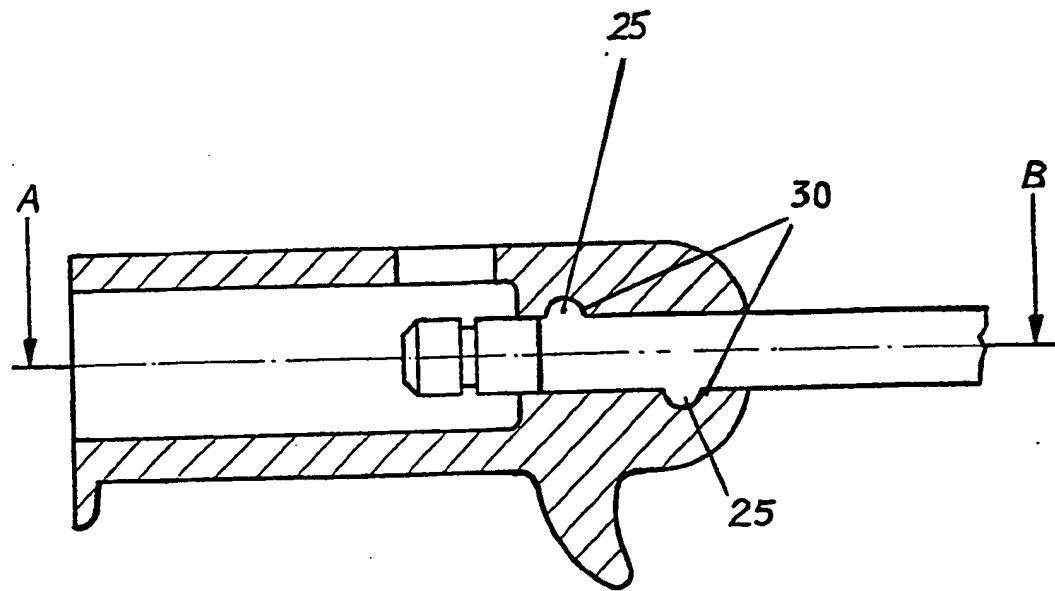


Fig. 10

## SPECIFICATION

## Retractor for surgical purposes

5 The present invention relates to retractors for surgical purposes, comprising a hook blade section of light-conducting material and a handle, which may be coupled to a fibrous or fluid light conductor and whose hook blade section has a light egress area  
10 directable towards the region of the injury.  
Retractors of this kind have been disclosed in the German Offenlegungsschrift No. 30 23 266, and in the German Gebrauchsmuster Specification No. 8221 649.  
15 It is an object of the present invention to provide a retractor whose material is adapted to the purposes of application in question.  
The invention consists in a retractor for surgical purposes comprising a hook blade section of light-  
20 conducting material and a handle which may be coupled to a fibrous or fluid light conductor, said hook blade section having a light egress area that can be directable towards the injured part, wherein the retractor consists of sterilisable material.  
25 The retractor preferably consists of material sterilisable by means of steam and/or gamma radiation, the material sterilisable by means of steam being a glass, such as borosilicate or optical glass, and/or at least one of the plastics materials polysulphone,  
30 polyether sulphone, polycarbonate, polytetrafluoroethylene, silicone rubber or fluoroethylene-  
propylene, or a metal such as high-grade steel or a copper-zinc alloy, and the material sterilisable by means of gamma radiation is at least one of the  
35 plastics materials acrylbutadiene styrene, polystyrene or cellulose ester. The retractor is preferably assembled inseparably from several individual components, or consists of individual components which are releasably assembled into a unit. The retractor  
40 appropriately has a light-conducting hook blade section of glass, formed in hook shape, which is secured by means of an upper and lower securing sections formed in hook shape and comprising handle sections of sheet form. The light-conducting  
45 hook blade may preferably be held fast by a hook-shaped securing section, a lower handle section of shell form and upper handle section of shell form, and a securing ring engageable therewith. The light-conducting section of the retractor preferably  
50 consists of PMMA which is omnilaterally ensheathed by polycarbonate, the polycarbonate having a thickness of no more than say 1 to 2 mms in the region of the light egress area. The retractor advantageously consists of a borosilicate glass which is omnilaterally  
55 ensheathed in PTFE, silicone rubber or FEP, the retractor having an excision in the plastics material in the region of the light egress area. Furthermore, the retractor may preferably be formed in one piece and consist of light-conducting polycarbonate. It is  
60 preferably constructed in multi-sectional form, at least on part consisting of material sterilisable by means of steam, and at least one part of material sterilisable by gamma radiation, either the end of the hook blade section comprising the light egress area  
65 or the hook blade as a whole being removably

arranged and consisting of material sterilisable by means of gamma radiation, and the remaining section in each case consisting of material sterilisable by means of steam. The hook blade section and

70 the handle in each case appropriately have a screw-thread. The hook blade section may preferably be fastened to the handle by means of a releasable plug-in connection constructed either for engagement by means of a catch-type connector or for  
75 being clamped, the handle having a lateral slot comprising at least one guide and securing section. Either the hook blade or the handle appropriately has a connector element for the light-conductor, which may be constructed as an insertable element  
80 and may at the same time act as a securing element for the hook blade. The insertable element advantageously consists of high-grade steel.

The advantages of the retractor constructed according to the invention consist in that depending

85 on the case of application, it may be utilised as a disposable element or as a reusable element, the retractable being made in one piece or from several individual components, according to requirements. Another advantage is that the retractor may be  
90 constructed in disassemblable manner.

In order that the invention may be more clearly understood, certain embodiments thereof illustrated in the drawings and will now be described. In these drawings:-

95 *Figure 1* shows a three-piece retractor,  
*Figure 2* shows a five-piece retractor.  
*Figure 3* shows a one-piece retractor comprising a light-conducting insertable element,  
*Figure 4* shows a one-piece retractor with edge protection,  
100 *Figure 5* shows a one-piece retractor comprising a light conductor connector as an insertable element,  
*Figure 6* shows a retractor comprising a removable hook blade tip,  
105 *Figure 7* shows a retractor comprising a removable hook blade section,  
*Figure 8* shows the connection between the handle and hook blade section by means of screw-threads,  
110 *Figure 9* shows the connection between the handle and hook blade section by means of an inserted key element, and  
*Figure 10* shows the connection between the handle and hook blade section by means of a lateral  
115 slot in the handle and locating wedges.

Referring now to the drawings, *Figure 1* shows a retractor which may be sterilised by means of steam up to 134°C. It comprises a hook-shaped light-conducting hook blade section 3 of glass, which has  
120 a light egress aperture 8 directable towards the injured region, an upper securing element 2 formed in hook shape and a lower securing element 1 also of hook shape. Both the upper and lower securing elements formed in hook shape each have a handle section 20 and 19 respectively, and a hook section 22 and 21 respectively. In the area of the light egress aperture, the upper securing element 2 comprises an aperture 9 for light egress. An insertable element of steel is provided as a light conductor connector 10.  
125 *Figure 2* shows the connection between the handle and hook blade section by means of a lateral slot in the handle and locating wedges.

130 The securing elements consists of plastics material,

e.g. polysulphone, polyethersulphone, polyetherketone. After the hook blade section 3 is placed between the securing elements 1 and 2, the plastics material sections are glued or welded to each other.

5 The joints between the upper securing element 2 and the hook blade 3 in the area of the light egress aperture 8, and between the hook blade 3 and the light conducting connector 10, are luted.

Figure 2 shows the parts of a retractor which, after 10 each use, may be disassembled, cleaned, reassembled and thereafter sterilised by steam up to 134°C. It comprises a light-conducting hook blade section 3 having a light egress aperture 8 directable towards the region of injury, a securing element 6 bent to 15 hook shape, an upper handle section 5 of shell form, a lower handle section 4 of shell form, to which the light conductor connector 10 is fastened, and the securing element 7. The retractor is assembled in such manner that the hook blade section 3 is inset 20 into the securing element 6, the securing ring 7 is engaged thereon and the whole unit is inserted into the lower handle section 4 of shell form. Finally, the upper handle section 5 in shell form is placed thereon and secured by the securing ring 7. Provided 25 that it is sufficient to sterilise the retractor by means of steam at up to 121°C only, polycarbonate may be utilised as the plastics material. Regarding the distribution of the individual elements of assemblable plastics material, selection of the form most 30 suitable for the purpose in each case lies within the capability of one skilled in the art. The retractor may thus be devised for assembly from more than five or less than five individual elements.

Figure 3 shows a retractor whose light-conducting 35 hook blade section 12 consists of a plastics material moulding or PMMA, which is ensheathed by injection moulding with a temperature-resistant but not as transparent a plastics material 12, for example polycarbonate. In the region of the light egress area 40 8, the material has a thickness of say 1 or 2 mms, so that the poorer optical properties do not come into play during light egress. A retractor of this kind may be sterilised by means of steam up to 121°C.

Figure 4 shows a retractor sterilisable in an 45 autoclave up to 134°C, which is produced from a glass and is omnilaterally coated with a fused-on plastics material such as PTFE or FEP or silicone rubber. The vitreous retractor 13 is ensheathed with the plastics material coating 12, the plastics material 50 coating 12 having an aperture 14 in the region of the light egress opening 8. The plastics material coating acts as a protection against splintering and for edges, as well as to limit emission of radiation. It is unnecessary for the plastics material coating to be 55 transparent.

Figure 5 shows a retractor produced in one piece, comprising a cast-in light-conductor coupling consisting of polycarbonate. A retractor of this kind may be sterilised by means of steam up to 121°C.

60 Figure 6 shows a retractor of multisectional construction, the extremity of the hook blade section comprising the light egress area 15 being formed in removable manner due to a detent-type connection, and consisting of material sterilisable by means of 65 gamma radiation. The part 16 comprising the handle

and the cast-in light-conductor coupling 10 consists of material sterilisable by means of steam, and is sterilisable up to 121°C or 134°C, depending on the material utilised.

70 Figure 7 shows a retractor the hook blade section 17 of which as a whole consists of material sterilisable by means of gamma radiation and is releasable from the handle 18 which consists of material sterilisable by means of steam.

75 Figure 8 shows a hook blade section 17 and a handle or grip 18 with a thread 23. The thread must be at least 2-start so that a rotation of about 180° is sufficient for securing purposes.

In Figure 9 the end of the hook blade section 17 80 turned towards the handle 18 is illustrated with notches 28, and is held in the handle 18 in the form of an insertable element 19 such as a key. The insertable element is simultaneously constructed as a connector element for a light conductor.

85 Figure 10 shows a cross-section through a handle 18 connected to a hook blade section 17, the hook blade section comprising a connector element 26 for the light conductor, comprising two beads 25. The handle 18 has a lateral slot 24 having two guiding 90 and locating recesses 30. The beads 25 engage in the corresponding recesses 30 in the handle 18. The connection is secured by means of a light conductor which may be coupled to the connector element 26. A reversed arrangement of recesses 30 and beads 25 95 may be used if desired.

Another fastening possibility consists in utilising an insertable element in the handle, in the form of a ring. At its extremity, the hook blade section has an annular groove so that the section may be secured 100 by means of a transverse pin.

The handle and retractor may also be joined by jamming or gripping by tapering shaping of the parts in question. Other possible methods of connection, as well as light conductor couplings, may be 105 applied in manner known per se.

Based on the different embodiments of the retractor according to the invention, it is possible to utilise the retractor either as a whole or in part as a 110 disposable article or as a reusable item of merchandise. Parts of the retractor or the retractor as a whole, is sterilised by gamma radiation and supplied to the user in a sterile pack. After being used once, these parts cannot be used again. Retractors of material 115 sterilisable by means of steam, or parts of retractors of material sterilisable by means of steam, are sterilised by the user himself before application by means of a steam sterilisation appliance normally available to a user.

## 120 CLAIMS

1. A retractor for surgical purposes comprising a hook blade section of light-conducting material and a handle which may be coupled to a fibrous or fluid 125 light conductor, said hook blade section having a light egress area that can be directable towards the injured part, wherein the retractor consists of sterilisable material.

2. A retractor as claimed in claim 1, which 130 consists of a material sterilisable by means of steam

or gamma radiation.

3. A retractor as claimed in claim 2, wherein the material sterilisable by means of steam is a glass such as borosilicate or optical glass or a metal such as high-grade steel or a copper-zinc alloy.

4. A retractor as claimed in claim 2, wherein the material sterilisable by means of steam is at least one of the plastics materials polysulphone, polyether sulphone (PES), (PEEK), polycarbonate (PC), polytetrafluoroethylene (PTFE), silicone rubber (SI) or fluoroethylenepropylene (FEP) or a metal such as high-grade steel or a copper-zinc alloy.

5. A retractor as claimed in claim 2, wherein the material sterilisable by means of gamma radiation is at least one of the plastics materials acrybutadiene-styrene (ABS), polystyrene (PS) or cellulose ester.

6. A retractor as claimed in claim 3 or 4, which is inseparably assembled from several individual components.

20 7. A retractor as claimed in claim 3 or claim 4, which comprises several individual components which are separably assembled into a unit.

8. A retractor as claimed in claim 6 or 7, which comprises a hook blade section of glass, which is formed in hook shape and is light-conductive.

9. A retractor as claimed in claims 6 and 8, wherein the light-conducting hook blade section is held by an upper and lower securing section formed in hook shape and comprising handle sections of shell form.

30 10. A retractor as claimed in claims 7 and 8, wherein the light-conducting hook blade section, a securing element formed in hook shape, a bottom handle section of shell form and an upper handle section, are held together by means of a securing ring engageable therewith.

11. A retractor as claimed in claims 3 and 4, wherein the light-conducting section consists of polymethylmethacrylate (PMMA), which is omnilaterally ensheathed in polycarbonate, which has a thickness of no more than 1 to 2 mms in the region of the light egress surface.

40 12. A retractor as claimed in claims 3 and 4, which consists of a glass which is omnilaterally ensheathed in PTFE, silicone rubber of FEP, the retractor having an excision in the region of the light egress area in the plastics material.

13. A retractor as claimed in claim 3, which is formed in one piece and consists of light-conducting polycarbonate.

50 14. A retractor as claimed in claims 4 and 5, which has a multisectioal structure, at least one section consisting of material sterilisable by means of steam and at least one section consisting of a material sterilisable by gamma radiation.

55 15. A retractor as claimed in claim 14, wherein either the end of the hook blade section comprising the light egress area of the hook blade section as a whole, is constructed to be removable, and consists of material sterilisable by gamma radiation, the remaining part consisting of material sterilisable by means of steam, in each case.

60 16. A retractor as claimed in claim 15, wherein the hook blade section and the handle in each case 65 comprise a screw-thread for mutual screw-connection.

17. A retractor as claimed in claim 15, wherein the hook blade section is fastenable to the handle by means of a releasable plug-in connection.

70 18. A retractor as claimed in claim 17, wherein the hook blade section has a detent-type connector.

19. A retractor as claimed in claim 18, wherein the handle has a lateral slot comprising at least one guiding and securing recess.

75 20. A retractor as claimed in any of claims 16 to 19, wherein in that the hook blade section has a connecting section for the light conductor.

21. A retractor as claimed in any of claims 16 to 19, wherein the handle has a connecting section for 80 the light conductor.

22. A retractor as claimed in claim 20 or 21, wherein the connector element is constructed as an insertable element.

23. A retractor as claimed in claim 21, wherein 85 the insertable element is constructed as a securing element for the hook blade section.

24. A retractor as claimed in claim 22, wherein the insertable element consists of high-grade steel.

25. A retractor substantially as hereinbefore 90 described with reference to any one of Figures 1 to 10 of the accompanying drawings.

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